

Rita sacerdotum, a valid species of catfish from Myanmar (Pisces, Bagridae)

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SYNOPSIS. *Rita sacerdotum* Anderson, 1879, is the valid name for the only species of the south Asian bagrid catfish genus *Rita* that resides in Myanmar. This species is distinguished from other species of *Rita* by a comparatively short dorsal-fin spine that never extends to the adipose fin base; palatal tooth patches, composed primarily of uniformly sized molariform teeth, that are in broad contact across the midline anteriorly, but diverge posteriorly and terminate in an acute point; and a small eye that is only about one-eighth to one-tenth the length of the head. *Rita sacerdotum* resides in the Sittoung and Ayeyarwaddy rivers, at least as far north as Myitkyina, Kachin State. This species is redescribed and a new key to the species of *Rita* is provided.

INTRODUCTION

The south Asian catfish genus *Rita* is broadly distributed in India, Bangladesh, Nepal, the Indus plain of Pakistan, and the Ayeyarwaddy system of Myanmar. Jayaram (1966) provided a systematic account of the species of the *Rita*, and subsequent reviews have been provided by Misra (1976), Jayaram (1977, 1981), and Talwar & Jhingran (1991). In each of these treatments, four species of *Rita* are recognized, although the specific names used for some of the species differ.

The identity of the single species of *Rita* that inhabits the Ayeyarwaddy River, the focus of this paper, also varies among these studies. This uncertainty has existed since the earliest accounts of the presence of *Rita* in Myanmar waters, its persistence due in part to the dearth of material available for study and an enigmatic proposal of a name for the Ayeyarwaddy species. I recently obtained additional specimens of this species, and this prompted me to reexamine the question of their identity. The discovery of the holotype of *Rita sacerdotum* Anderson, 1879, a specimen that has, for all intents and purposes, been lost since the species was named, revealed that there is only one species of *Rita* in the Ayeyarwaddy system, and that *Rita sacerdotum* is the valid name for that species.

METHODS AND MATERIALS

Measurements are all straight line distances. Specimen lengths are all reported as standard length. Institutional abbreviations follow Leviton *et al.* (1985). Other abbreviations used herein are: HL – head length; SL – standard length.

When referring to previously published accounts of the region and in the list of the specimens examined, I repeat the name Burma (or Burmah), for the country now known as Union of Myanmar. In all other places, I use Myanmar. Throughout the text, I use the officially accepted spellings: Yangon for Rangoon, Ayeyarwaddy for Irrawaddy, Bago for Pegu, and Sittoung for Sittang or Sitang.

MATERIAL EXAMINED

Rita chrysea, 54 specimens, 61–205 mm.

INDIA: Orissa, Mahanadi River at Cuttack, K. Jayaram, CAS 54540 (6:107–130 mm, 1 cleared & stained). Mahanadi River basin, Sonepur fish market, T. Roberts, 19–22 Feb 1985, CAS 61855

(43:61–205 mm). Mahanadi River at Amicut, Cuttack, K. Jayaram, 23 Oct 1954, SU 48799 (2:110–118 mm). Bihar, Sheonath River at Bisrampur, A. Herre, 13 Dec 1940, SU 41043 (1:106 mm).

Rita gogra, 6 specimens, 112–205 mm.

INDIA: Andhra Pradesh, Poona, Bombay Pres., A. Herre, 1940, SU 41044 (1:123 mm). Maharashtra, Godavari River, Nanden market, K. Jayaram, 10 Feb 1955, USNM 11494 (1:112 mm). Karnataka, Krishna River basin, Tungabhadra River or reservoir at Hospet, Hampi, or Kampli, T. Roberts, 28 Jan–3 Feb 1985, CAS 62088 (5:138–205 mm).

Rita kuturnee, 8 specimens, 57–97 mm.

INDIA: Andhra Pradesh, Tungabhadra River, K. Jayaram, 10 Feb 1955, USNM 114950 (3:61–88 mm); Tungabhadra River, at Kurnool, K. Jayaram, 10 Feb 1955, SU 48798 (2:57–59 mm). Karnataka, Krishna River basin, Tungabhadra River or reservoir at Hospet, Hampi, or Kampli, T. Roberts, 28 Jan–3 Feb 1985, CAS 62077 (1:59 mm). Maharashtra, Poona, A. Herre, 9 Apr, 1937 SU 34868 (2:83–97 mm).

Rita rita, 16 specimens, 24–258 mm.

INDIA: Bihar, Ganges River at Patna, T. Roberts, Apr–May 1996, CAS 92501 (1:61 mm). Uttar Pradesh, Allahabad, Ganga River, 8–12–1974 [sic], USNM 317823 (1:214 mm). West Bengal, Hugli River at Pulta, A. Herre, 23 Oct 1954, SU 34866 (10:70–94 mm, one additional specimen in lot, not examined). Calcutta, A. Herre, 9 Apr 1937, SU 34867 (2:187–194 mm). Calcutta, A. Herre, 6 Apr 1937, SU 14132 (1:258 mm). BANGLADESH: North Central Region, Tangail District, Ganges River basin, 5 Nov 1992, CAS 92411 (1:24 mm).

Rita sacerdotum, 23 specimens, 22–690 mm.

MYANMAR: ‘3rd Defile of Irrawaddy River, Upper Burmah, Dr. Anderson’, BMNH 1875.8.4.7 (1:690 mm, holotype of *Rita sacerdotum*). Sittoung River, E. Oates, BMHN 1891.11.30:242 (1:285 mm), BMNH 1891.11.30.343 (1, disarticulated dry skeleton, not measured). Ayeyarwaddy Division, Wa-ke-ma town market, 17 Sep 1996, Myint Pe, NRM 40631 (4:107–135 mm). Bago Division, Bago market, 25 Oct 1997, C. J. Ferraris, Myint Pe, Mya Than Tun, BMNH 1998.3.11.1 (1:150 mm), CAS 99210 (1:126 mm). Yangon Division, Hlaing River, 31 Oct 1997, C. J. Ferraris, Mya Than Tun, CAS 99309 (10:22–70 mm). Insein market (northern Yangon), July 1996, Myint Pe, AMNH 224490 (1:195 mm). Insein market, Nov 1997, Pe, C. J. Ferraris, Mya Than Tun, USNM 348211 (2:191–203 mm).

mm). Rangoon Market, A. Herre, 14 Nov 1940, SU 39869 (2:172–184 mm).

HISTORY OF THE IDENTIFICATION OF THE AYEYARWADDY RITA

Day (1873) provided the first mention of *Rita* from the Ayeyarwaddy River in his account of the fishes of India and British Burma, under the name *Rita ritoides* (Valenciennes, 1840), a name now considered a junior synonym of *Rita rita* (Hamilton, 1822) (Jayaram, 1966). Several years later Day (1877) included the Ayeyarwaddy within the range of *Rita buchanani* Bleeker 1853, another junior synonym of *Rita rita*. Day acknowledged that *Rita ritoides* might have been the appropriate name for the species, but departed from his earlier use of that name and, without explanation, used *R. buchanani* instead.

The name *Rita sacerdotum* was proposed in Anderson (1878 [1879]) for a species from the middle reaches of the Ayeyarwaddy River. As noted by Jayaram (1966), several authors have attributed the description of this species to Francis Day, presumably on the basis of a statement in the book's acknowledgements (Anderson, 1878 [1879]: xxiv) which states that Day 'favored me with a list of fishes collected on the First Expedition, and undertook the description of certain species'. However, the species described by Day are those published elsewhere (Day 1870a, 1870b, 1871) and not the ones that first appeared in Anderson (1878 [1879]). The style of writing and the choice of anatomical characters are significantly different from that of Day's other published species descriptions. It is important to note that the actual publication date for the species description, and for the volume as a whole, differs from that on the title page. A statement in the published corrigenda that follows the title page clearly indicates that publication was unexpectedly delayed past 1878, the date on the title page, and was issued, instead, in 1879.

Anderson's (1878 [1879]) description of *Rita sacerdotum* was based on his field observations of living examples of the species that were treated as pets by the residents of a Buddhist temple as well as a single specimen that was secured and illustrated. The account was published in a summary of an expedition to western Yunnan, along with accounts of other species from Yunnan and 'upper Burmah'. Because of the title of the publication, some accounts have mistakenly cited the type locality of this species as Yunnan.

In neither Day's (1888) Supplement to the fishes of India, nor his modified and updated version of his earlier book (Day, 1889) is Anderson's *Rita sacerdotum* (or the other two fish species described by Anderson) mentioned. The reason for this curious omission is unknown. It is possible, but highly unlikely, that Day was unaware of Anderson's book with its included species accounts. Day and Anderson must have known each other, as evidenced by the above mentioned acknowledgement of Day's assistance by Anderson. Day may have considered the species to lie outside the scope of his own book, as it was described from Upper, rather than British, Burma. For whatever reason, Day's failure to include mention of *Rita sacerdotum* in either of the two accounts he published on fishes of southern Asia appears to have been a major factor in the subsequent oversight of Anderson's name.

Vinciguerra (1890) reported on a specimen of *Rita* from the vicinity of Yangon, under the name *Rita ritoides*. He noted that his specimen differed from the typical form of *R. ritoides* in the relative length of the dorsal spine and the shape of the humeral process. Vinciguerra compared his specimen with the description of *Rita sacerdotum*, and decided that it too differed from his specimen on

several features, but that the two specimens shared a comparatively short dorsal-fin spine. On that basis, he concluded that two distinct forms of *Rita ritoides* existed, one in Myanmar and one in India.

After a period of more than a half century without any mention of *Rita* from the Ayeyarwaddy, Jayaram (1966) revised the genus *Rita* and concluded that two species were found in Myanmar: *Rita rita* and *R. kuturnee* (Sykes, 1839). Inclusion by Jayaram of *Rita rita* in the fauna of Myanmar appears to be based solely on the literature accounts of Day (1873) and Vinciguerra (1890). Jayaram tentatively placed *Rita sacerdotum* into the synonymy of that species. All of the specimens from the Ayeyarwaddy River, or elsewhere in Myanmar, that were cited as having been examined by Jayaram were listed in the account of *Rita kuturnee*. However, *Rita kuturnee*, and its widely used junior synonym *Rita hastata* (Valenciennes, 1840), is a species otherwise known only from the rivers of peninsular India. Talwar & Jhingran (1991) doubted that *R. kuturnee* actually occurs in Myanmar, even though Jayaram (1977, 1981) had continued to list it in subsequent accounts of the distribution of that species.

Misra (1976) included Myanmar in the distribution of *Rita rita*, but not that of *R. kuturnee*. In his abbreviated synonymy for *R. rita*, there is no mention of *R. sacerdotum*, and the publication of Anderson (1878 [1879]) is likewise missing from the literature cited. Talwar & Jhingran (1991) similarly listed *Rita rita* as the only species of *Rita* from Myanmar, but they tentatively included *Rita sacerdotum* in the synonymy of that species.

IDENTITY OF THE AYEYARWADDY SPECIES OF *RITA*

Although much of the recent literature suggests that the *Rita* species inhabiting the Ayeyarwaddy River is *Rita rita*, the species in that basin is, in fact, clearly distinct from *R. rita*. During this study, specimens of *R. rita*, from various parts of the Ganges basin, the type locality of the species, were found to exhibit characters lacking in specimens from the Ayeyarwaddy. As first noted in Jayaram (1966), the palatal teeth of the Ayeyarwaddy *Rita* specimens are not arranged in the broad, elliptical patches characteristic of *R. rita* but, instead, in 'pear-shaped' patches that tapered posteriorly nearly to a point (Figure 1a). In addition, the dorsal-fin spine of *R. rita* is long and stout with its length at least equal to the head length. The adpressed spine usually extends well past the adipose-fin origin, at least in large individuals. Day (1877) noted that the relative size of the spine was apparently allometric, and that in small individuals it may only equal the head length, but that in larger individuals it may exceed 1.3 times HL. In Ayeyarwaddy specimens, in contrast, the dorsal-fin spine is never as long as the head and, more typically, it is shorter than the head minus the snout, even in the largest specimens.

In contrast to the prevailing view, Jayaram (1966) identified the Ayeyarwaddy specimens as *R. kuturnee*. It appears that his conclusion is based primarily, but erroneously, on the similarity of the palatal tooth patches in the two species. In placing the Ayeyarwaddy *Rita* into *R. kuturnee*, he also looked beyond several striking differences between the two species. For example, the eye size of *R. kuturnee* is significantly larger than that of the Ayeyarwaddy *Rita*. In his diagnosis of *R. kuturnee*, Jayaram (1966) lists the eye size as 'Eye 3.07 (2.70 to 4.70 or up to 8.80 in specimens from Burma) in head length; 1.35 (1.00 to 1.50 or 3.90) in interorbital space width; 1.39 (1.00 to 1.50 or 3.00) in snout length.' It is possible that Jayaram interpreted the consistent disparity in eye proportions between the Indian and Ayeyarwaddy specimens as a result of allometric growth in *R. kuturnee*. All of the specimens he examined from

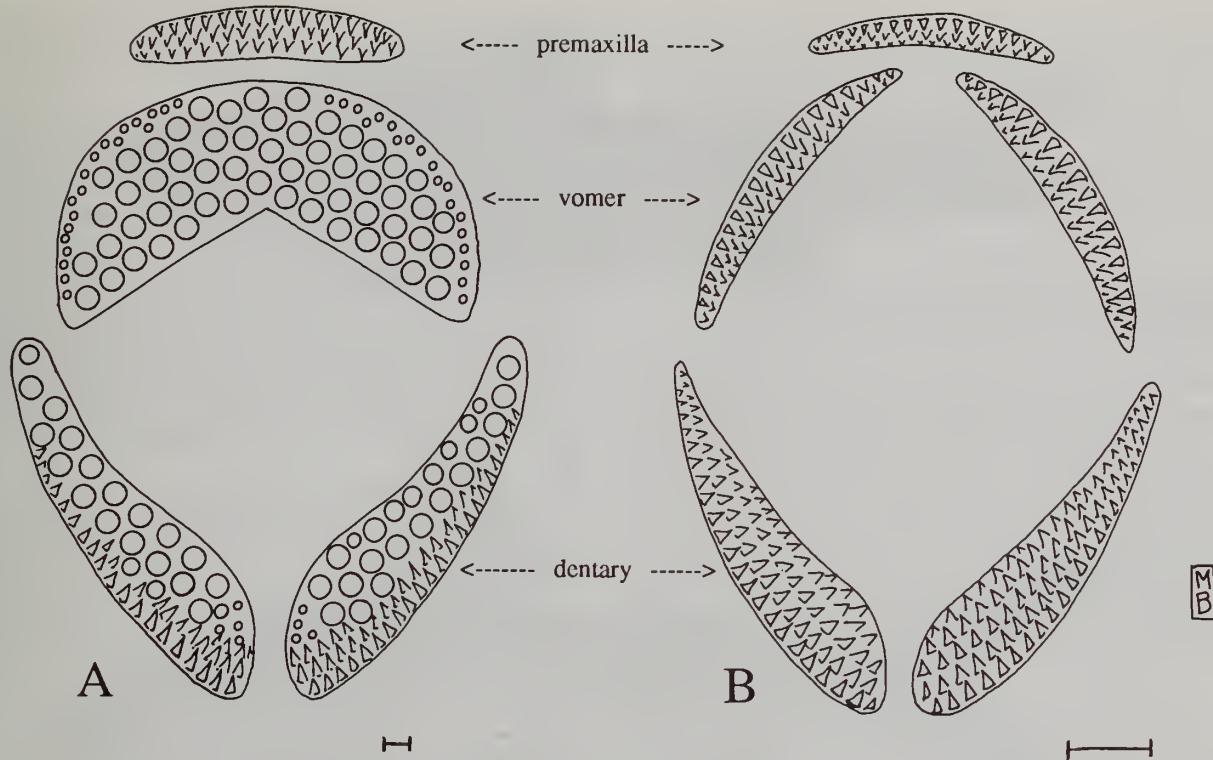


Fig. 1 Diagrammatic representation of tooth patches on jaws and palate of *Rita* species. A. *Rita sacerdotum* Anderson, 184 mm, SU 39869. Scale bar = 1 mm.; B. *Rita kuturnee* (Sykes), 97 mm, SU 34868.

peninsular India are substantially smaller (36 to 103 mm) than any of the specimens listed from Myanmar (184 to 318 mm). In the Ayeyarwaddy specimens that I examined (22 to 285 mm), the eye length is always 8 to 10 times in the head length. Curiously, despite the observation that the Ayeyarwaddy specimens has small eyes, Jayaram used the eye size of *R. kuturnee* to help distinguish it from *R. chrysea*, a species for which he lists the eye diameter as '3.76 (2.83 to 5.22)' in head length. Clearly he did not take into account the Ayeyarwaddy specimens in this diagnosis of *R. kuturnee*.

The shape of the palatal tooth patches, a characteristic on which Jayaram placed heavy emphasis, also differs between *Rita kuturnee* and the Ayeyarwaddy form. The 'pear-shaped' tooth patches that Jayaram (1966, Figure 1b) described and illustrated as characteristic of *R. kuturnee* appear, in fact, to be those of the Ayeyarwaddy river species, and not *R. kuturnee*. In all of the specimens of *R. kuturnee* that I examined, the palatal tooth patches are slender, crescent-shaped arches that are either separated at the midline (Figure 1b), or meet only for the width of a single row of teeth. The palatal tooth-patches in *Rita kuturnee* have stout conical teeth, larger in size than those of the premaxilla, rather than the broadly rounded, or molariform ones that predominate in the palate of the Ayeyarwaddy species (Figure 1a). As with the size of the eye, it is possible that Jayaram assumed that his specimens of *R. kuturnee* from peninsular India were juveniles, with incompletely developed palatal tooth patches, and that the adult condition in the peninsular population is like that in the Ayeyarwaddy specimens. Even in the smallest examined specimens from the Ayeyarwaddy basin the palatal tooth patches are broadly in contact across the midline and are composed primarily of molariform teeth. Thus, I conclude that the Ayeyarwaddy form is not conspecific with *Rita kuturnee*.

The Ayeyarwaddy River *Rita* population has never been consid-

ered conspecific with either of the two other Indian *Rita* species, *R. chrysea* Day, 1877 and *R. gogra* (Sykes, 1839), and I have found no reason to assign either name to the Ayeyarwaddy fishes. *Rita chrysea*, restricted to the Mahanadi River and nearby tributaries in Orissa and considered to be the smallest species of *Rita* (Talwar & Jhingran, 1991), is characterized by a large eye (2.8 to 5.2 in HL) and by having a broad, nearly rectangular, patch of molariform teeth that extends across the midline of the palate (Jayaram, 1966). *Rita gogra*, which is sometimes listed as *Rita pavimentata* (Valenciennes, 1840) (e.g., Misra, 1976; Talwar & Jhingran, 1991), is known only from rivers of the Deccan region of peninsular India, including the Krishna, Harda, Godavari, Tungabhadra, Manjra, Bhima, and Mutha-Mula (Jayaram, 1966). Although similar in overall appearance with the Ayeyarwaddy *Rita*, *R. gogra* can be distinguished immediately by the unusual shape of its head. The dorsal surface of the head, posterior to the orbits, is dominated by a bilaterally symmetrical swelling formed by massive extensions of the adductor mandibulae muscle that cover the cranial roofing bones. All other species of *Rita*, including the Ayeyarwaddy species, have the dorsal surface of the cranium covered only with skin, through which the cranial roofing bones can easily be palpated. In addition, the Ayeyarwaddy *Rita* can be distinguished from *R. gogra* by the color of the mental barbel (black in *R. gogra*, white in the Ayeyarwaddy species). The palatal tooth-patch in *R. gogra* has finely conical teeth anteriorly and increasingly large molariform teeth posteriorly (Jayaram, 1966).

Thus, it must be concluded that the Ayeyarwaddy *Rita* is not conspecific with any of its Indian congeners. The only remaining name that might apply is *Rita sacerdotum*, which was described from the Ayeyarwaddy. The description and published illustration of that species, however, only vaguely resembles a *Rita*, and characteristics of the Ayeyarwaddy species are either absent from the

description, or in variance with the illustration. Although Jayaram (1966) followed Vinciguerra (1890) in placing *Rita sacerdotum* into the synonymy of *Rita rita*, he placed the specimens he examined from the Ayeyarwaddy into a second species of *Rita*. I have been unable, so far, to find any specimens that represented a second species from Myanmar. Clearly, an examination of the holotype of *Rita sacerdotum* was necessary to determine whether it indeed represented a species of *Rita* different from the one that I, and others, have observed.

THE HOLOTYPE OF *RITA SACERDOTUM* ANDERSON

Anderson (1878 [1879]) did not indicate where the holotype of *Rita sacerdotum*, or any of the other species described in the same paper, were deposited. Although I expected to find the specimen in The Natural History Museum, London, the holotype was not listed in its type catalog, and there was no entry for *R. sacerdotum* in their species catalog. In fact, no specimen of *Rita* collected by Anderson was listed in the catalog. An exhaustive search through the registers did uncover a *Rita sacerdotum* collected by Anderson, without any indication that it was a holotype. With the assistance of the staff of the Fish Section of the Zoology Department, the specimen was

found among the collection of stuffed, dried fish specimens. Its identity as the holotype was promptly made by comparison of the stated locality information and by direct comparison with the published illustration.

It is puzzling that the specimen was never recognized as the holotype of *Rita sacerdotum*. Although the specimen was registered in 1875, prior to Anderson's publication, the register entry (BMNH 1875.8.4.7) lists the name and is surrounded by entries for the other species named by Anderson. It is even more surprising that although the specimen was registered with the new name during Albert Günther's tenure, he did not include the specimen in his personal annotated copy of his catalog (Günther, 1868) or annotate the register entry to indicate that the specimen was a holotype. Nonetheless, with the discovery of the holotype, it is now possible to clarify some peculiar features in the illustration of *Rita sacerdotum* and, with that information, finally resolve the identity of the Ayeyarwaddy *Rita*.

The holotype of *Rita sacerdotum* is a dried, stuffed specimen, 69 cm in standard length (Figure 2). The specimen appears to have been placed on display at two different times, based on the fact that the stuffed skin has two sets of wire attachments. One set of mounts, extending from the ventral surface of the body, indicate that the specimen was at one time mounted freestanding, probably on a



Fig. 2 *Rita sacerdotum* Anderson, holotype, 69 cm, BMNH 1875.8.4.7.



Fig. 3 Published illustration of holotype of *Rita sacerdotum*, reproduced from Anderson (1878 [1879], pl. 79, Fig. 3).



Fig. 4 *Rita sacerdotum* Anderson, 150 mm, BMNH 1998.3.11.1.



Fig. 5 *Rita sacerdotum* Anderson, 126 mm, CAS 99210.

wooden stand. A second pair of wires protrudes from the left side of the body, suggesting that the specimen was mounted on a wall, with the right side of the body on display.

The published illustration of the holotype (Figure 3) resembles the mounted specimen quite closely, except for some damage to the fins. Most importantly, the elongated caudal region of the body, which is identical in proportion to that in the illustration, suggests that the illustration was probably prepared from the dried mount rather than the freshly collected specimen. The body of the specimen is disproportionately long and the caudal region is far more slender and cylindrical than other specimens of *Rita* from the Ayeyarwaddy (Figures 4, 5). This unusual body form, and the illustration that resulted from drawing the dried specimen, have made comparison between the illustration and fresh specimens of the species problematic. On close inspection, it appears that the body of the mounted specimen must have been stretched well beyond the normal proportions of the species when it was stuffed. As Anderson collected only a single specimen, it is reasonable to assume that he or his taxidermist had no model to use to shape his specimen, once it was skinned and the vertebral column removed. Although the general shape of the body does not closely resemble the other specimens from the Ayeyarwaddy, other features of the body are, in fact, quite similar and clearly indicate that the holotype and the other available specimens are conspecific. The shape of the palatal tooth patches, the unusually short dorsal spine, and small eye combine to distinguish this species from its congeners. All of the specimens that I have examined exhibit this same suite of characters, albeit with some

ontogenetic variation. It appears therefore that there is only one species of *Rita* in the Ayeyarwaddy system, and that the oldest available name for that species is *Rita sacerdotum*.

DIAGNOSIS AND REDESCRIPTION OF *RITA SACERDOTUM*

As noted above, the inaccurate taxidermic preparation of the holotype of *Rita sacerdotum* made the specimen longer than it would have been in life, and this precludes using the specimen for any proportional measurements standardized against the body length. Therefore, any statement in the description that relates a body measurement to the standard length does not include the holotype.

Diagnosis

Rita sacerdotum is readily distinguished from all congeners by the following combination of characteristics: eye small, its diameter 10–13% head length; dorsal-fin spine length no greater than the length of the head posterior to the snout; adpressed dorsal-fin spine does not extend to adipose-fin origin; and palate with a single crescent-shaped patch of primarily large, bluntly conical, teeth of approximately uniform size.

Description

Body elongate, slightly compressed anteriorly, progressively more

compressed toward caudal fin. Body deepest at dorsal-fin origin, its depth at that point approximately equal to distance from nasal barbel to opercular margin; body depth decreases gradually to adipose-fin origin, more rapidly thereafter. Least depth at caudal peduncle approximately equals snout length. Skin of body and head covered with thick coat of mucous, anchored by fine filamentous projections from skin surface; filaments largest and most dense on chin and opercular margin of head, and, especially, on lateral surface of body ventral to dorsal fin.

Vent slightly anterior to anal-fin origin. Lateral line midlateral and straight from past tympanum to hypural plate; anterior portion of lateral line more dorsally situated; lateral line bent sharply in the dorsal direction onto base of upper caudal-fin lobe posterior of hypural plate margin. Lateral line pores extend laterally from canal, through thick mucous coat. Anterior canal pores ramify and spread in asymmetric pattern over pectoral-girdle elements and tympanum. Cephalic canal pores similarly branch over dorsum of head and onto opercle.

Head large, its length approximately $3\frac{1}{2}$ times in SL; head slightly depressed, at pectoral-fin origin its depth approximately 80% its width; head depth at orbit approximately $2/3$ its width. Dorsal profile of head straight from orbit to snout, slightly convex posteriorly; ventral profile nearly straight. Mouth nearly terminal; upper jaw slightly overhangs lower. Teeth in upper jaw conical and sharply pointed, in 6 to 8 irregular rows. Tooth-bearing surface of premaxilla long and nearly transverse, its long axis four to five times its short axis. Tooth-bearing surface of mandible elongated, tapering posteriorly. Teeth in lower jaw pointed and conical along anterior margin of jaw, approximately equal in size to those of upper jaw; two rows of bluntly rounded teeth, much larger in size than conical teeth, present mesially; only blunt teeth present along posterior part of mandible. Palate with coalesced tooth patch extending across midline. Tooth patch convex anteriorly, concave posteriorly, with nearly parallel lateral margins. Teeth on palate nearly all in form of bluntly rounded pegs, slightly larger in diameter posteriorly, except for one or two rows of somewhat smaller teeth along lateral and anterolateral margins of toothplate. Gill rakers 24 to 29; anterior 8 to 10 rakers on lower arch rudimentary, shorter than intervening spaces; posterior rakers moderately long and thick.

Eye small, ovoid, with long axis parallel to body length; long diameter of orbit approximately $1/3$ snout length, $1/5$ interorbital width, and equal to or slightly greater than $1/10$ head length. Orbital margin free.

Anterior naris situated along anterior margin of snout, its opening a short tube, flared at margin, directed anteriorly. Posterior naris remote from anterior naris, and slightly more laterally situated; its anterior margin located midway between snout tip and anterior margin of orbit. Naris surrounded by short rim, connected to nasal barbel anteriorly.

Head with three pairs of barbels. Maxillary barbel extends from fold between upper lip and skin of snout; barbel filamentous, without fleshy attachment to snout. Maxillary barbel short, not extending to margin of bony opercle. Nasal barbel short, its length approximately equal to orbital diameter; adpressed barbel reaches only to anterior margin of orbit. Ventral surface of head with single pair of mandibular barbels; barbel originates at vertical through anterior orbital margin; barbel filamentous, extending to, or nearly to, vertical through pectoral spine origin.

Dorsal surface of supraoccipital, posttemporal and pterotic bones granular, remainder of head covered with smooth skin. Adductor mandibulae does not extend onto dorsal surface of cranium.

Upper lip with several rows of short papillae along margin; papillae often multifurcated at tip. Lower lip broadly connected to

skin of chin, separate laterally. Lip margin with papillae comparable to those of upper lip, at least medially.

Opercular membrane free from isthmus at margin, but attached more basally; membranes broadly connected across midline, but separated posterior to isthmus connection. Branchiostegal rays 7 or 8.

Dorsal-fin origin at approximately 40% of SL. Fin quadrangular, first ray longest and approximately two times that of last ray; last ray without membranous extension to body; fin margin straight. Fin base approximately $1/2$ of HL and shorter than interspace between dorsal fin and adipose fin. Dorsal-fin spine stout, with sharply pointed tip. Spine length equals head length minus snout, or approximately 15% SL. Anterior margin of spine produced into sharp keel, without serrations; lateral and posterior surfaces smooth. Dorsal spine preceded by fully formed spinelet. Dorsal fin preceded by coarsely granular predorsal bone; lateral extent of predorsal bone approximately equals that of supraoccipital spine. Dorsal fin rays II,7; posterior two rays appear as one, split at base.

Adipose fin large; anterior fin margin straight, convex distally. Fin extends posteriorly well past its posterior insertion.

Caudal fin deeply forked, lobes with acutely pointed tips; lobes slightly asymmetrical, dorsal lobe longer and sometimes with filamentous extension. Length of dorsal most primary ray approximately three times length of middle rays. Procurrent rays few, short, not extending anteriorly onto caudal peduncle. Caudal fin rays i,7,8,i.

Anal fin quadrangular, anterior rays longest; posterior rays progressively shorter, fin margin straight. Last ray not connected to caudal peduncle by membrane. Fin base short, approximately equal to that of adipose fin. Anal-fin origin slightly posterior to vertical through adipose fin origin. Anal-fin rays iv, 9-10.

Pelvic fin abdominal, its origin posterior to vertical through posterior insertion of dorsal fin. First branched ray longest, following rays only slightly shorter. Adpressed fin just reaches anal-fin origin. Pelvic-fin rays i,6.

Pectoral fin acutely pointed; first branched ray longest, its length approximately three times posterior-most ray. Pectoral-fin spine stout, sharply pointed at tip. Spine with short filament at tip, length of filamentous extension approximately equals snout length. Outer margin of spine produced into acute keel; keel very finely serrated for basal quarter, smooth for remainder of its length; in small specimens, most of spine margin covered with tiny transverse serrations. Inner spine margin with densely packed, pointed, retrorse serrations; serration height greater than length of space between successive serrations. Humeral process acutely pointed posteriorly, with a slightly rounded tip. In larger specimens, process becomes more rounded posteriorly, as in holotype (Figures 2, 3). Surface of humeral process granular, with granulations less coarse than those of cranial surface. Pectoral-fin rays I,10 or I,11.

Coloration in preservative

Body gray, darker dorsally, gradually becoming lighter ventrally; abdomen nearly white. Head dark gray dorsally, white ventrally; transition between gray and white regions fairly abrupt, occurring ventral to eye and approximately in line with maxillary barbel origin. Operculum gray with white margin. Orbit surrounded by distinct white ring. Maxillary barbel dark grey, mental barbel nearly white.

Dorsal, anal, and pectoral fins pale, with broad black margin. Pelvic fin uniformly pale or with some indication of dark margin. Caudal fin with fine dark margin on middle rays; darkened margin progressively larger toward lobe tips.

Distribution

Rita sacerdotum appears to be distributed widely through the Ayeyarwaddy River basin of Myanmar. Specimens examined during this study were all from the lower portions of the basin, but I observed a few large individuals in markets as far upriver as Mandalay. In addition, *Rita* is seen occasionally in the Myitkyina market (U Tun Shwe, pers. comm.). Outside of the Ayeyarwaddy basin and its extensive delta, there is one record of specimens from the Sittoung River (BMNH 1891.11.30.242–243), and two from the Bago River (BMNH 1998.3.11.1 and CAS 99210).

Natural History

Little is known about *Rita sacerdotum*. While small specimens, up to about 25 cm, are routinely found in markets of Yangon and smaller delta villages, at least during the rainy season (April to September; U Myint Pe, pers. comm.), large specimens are only rarely seen in markets. All of the specimens examined during this study appear to be juveniles and there is no published indication of the size of maturity for this species.

Individuals as small as 22 mm were obtained from the tidal rivers in the vicinity of Yangon in November, 1997. The presence of these tiny individuals in the lower course of the river suggests that *Rita* may reproduce in the estuarine part of the river and disperse more widely throughout the river at a larger size. This idea is supported by anecdotal reports that large numbers of large *Rita* appear at an island pagoda, in the middle reaches of the Ayeyarwaddy River, for a short period of time during monsoon season (U Nyi Nyi Lwin, pers. comm.). This may be indicative of a spawning migration.

Examination of the gut contents of a few specimens revealed that *Rita sacerdotum* feeds on a variety of aquatic and terrestrial invertebrates. Several specimens contained fragments of small glass prawns, and others contained pieces of winged insects. A comprehensive study of the food habits is not possible at this time due to the relatively small number of specimens available and the fact that the specimens in collections represent only juveniles.

KEY TO SPECIES OF *RITA*

1. Dorsal surface of head, between eyes and occipital spine, covered with thick layer of muscle; pelvic fin black *Rita gogra* (rivers of the Deccan region of peninsular India)
 - *Rita gogra* (rivers of the Deccan region of peninsular India)
2. Dorsal surface of head covered only with skin; pelvic fin pale 2
 2. Eye small, 10–13% HL 3
 3. Eye large, 30–40% HL 4
 4. Dorsal-fin spine as long, or longer than length of head, adpressed spine extends to or beyond adipose-fin origin (in specimens greater than 100 mm); palatal teeth in two elliptical patches, not meeting at midline; teeth on posterior extent of lower jaw and palate molariform, much larger than anterior teeth *Rita rita* (Ganges River basin)
 - *Rita rita* (Ganges River basin)
 5. Dorsal-fin spine no longer than head minus snout, adpressed spine not reaching adipose-fin origin; palatal teeth in a single crescent patch that extends across midline of palate; teeth on palate more or less uniform in size (Figure 1A) *Rita sacerdotum* (Myanmar: Ayeyarwaddy and Sittoung River basins)
 - *Rita sacerdotum* (Myanmar: Ayeyarwaddy and Sittoung River basins)
 6. Palatal teeth in slender patches along lateral margin of palate, no larger than teeth in upper jaw and not meeting at midline (Figure 1B), dorsal-fin spine smooth anteriorly, except for few serrae basally *Rita kuturnee* (rivers of Deccan region of peninsular India)
 - *Rita kuturnee* (rivers of Deccan region of peninsular India)

Palatal teeth in large quadrangular patch that covers most of palate; teeth large and molariform in middle of patch, smaller laterally; dorsal-fin spine with single row of antrorse serrae, for at least basal 2/3 of spine length *Rita chrysea* (Mahanadi River and nearby tributaries in Orissa)

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REFERENCES

Anderson, J. 1878 [1879]. *Anatomical and zoological researches: comprising an account of the zoological results of the two expeditions to Western Yunnan in 1868 and 1875; and a monograph of the two cetacean genera, *Platanista* and *Orcella**. 984 pp., 84 pls. Bernard Quaritch, London.

Day, F. 1870a. Remarks on some of the Fishes in the Calcutta Museum. – Part I. *Proceedings of the Zoological Society of London* 1869 (3): 511–527.

— 1870b. Remarks on some fishes in the Calcutta Museum – Part II. *Proceedings of the Zoological Society of London* 1869 (3): 548–560.

— 1871. Monograph of Indian Cyprinidae. Parts I–3. *Journal of the Asiatic Society of Bengal* 40 (pt 2, no. 1–4): 95–142, 277–367, 337–367, Pls. 9, 21–23.

— 1873. *Report on the fresh water fish and fisheries of India and Burma*. 307 pp. Office of the Superintendent of Government Printing, Calcutta.

— 1877. *The fishes of India, being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma, and Ceylon*. Part 3:369–552, pls. 79–138. Bernard Quaritch, London.

— 1888. *Fishes of India, supplement, October 1888*. pp. 779–816. Bernard Quaritch, London.

— 1889. *The fauna of British India, including Ceylon and Burma. Fishes*. I. xx + 548 pp. Taylor and Francis, London.

Jayaram, K.C. 1966. Contributions to the study of bagrid fishes (Siluroidea: Bagridae). I. A systematic account of the genera *Rita* Bleeker, *Rama* Bleeker, *Mystus* Scopoli, and *Horabagrus* Jayaram. *Internationale Revue der Gesamten Hydrobiologie* 51 (3): 433–450.

— 1977. Aid to the identification of the siluroid fishes of India, Burma, Sri Lanka, Pakistan, and Bangladesh. I. Bagridae. *Records of the Zoological Survey of India, Miscellaneous Publications, Occasional Paper* (8): 1–41.

— 1981. *The freshwater fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka – a handbook*. viii + 475 pp., 13 pls. Zoological Survey of India, Calcutta.

Leviton, A.E., Gibbs Jr., R.H., Heal, E. & Dawson, C.E. 1985. Standards in herpetology and ichthyology: Part 1. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985 (3): 802–834.

Misra, K.S. 1976. *The fauna of India and the adjacent countries. Pisces (second edition)*. Vol. 3, Teleostomi: Cypriniformes: Siluri. xxi + 367 pp., 15 pls. Controller of Publications, Delhi.

Talwar, P.K. & Jhingran, A.G. 1991. *Inland fishes of India and adjacent countries*. xx + 1158 pp. Oxford & IBH Publishing Co., Pvt. Ltd. New Delhi, Bombay and Calcutta.

Vinciguerra, D. 1890. Viaggio di Leonardo Fea in Birmania e regione vicine. XXIV. *Pisc. Annali del Museo Civico di Storia Nazionale de Genova, Milano*, (serie 2a) 9: 129–362, pls. 7–11.